

TABLE 2.—Nitrogen and chlorine in rain and snow (pounds per acre)

Date	Precipitation in inches		Chlorine	Free amm.	Alb. amm.	Nitrate	Nitrite	Sulphate SO ₂
	Rain	Snow						
1933								
June 22	0.5		1.27	0.0064	0.0064			
25	.45		.37	.002	.011			
Sept. 24	.25		.40	.011	.008		0.00006	
26	1.15		1.85	.084	.029		.00036	
Oct. 8	.47		.77	.029	.017		.0002	
10	.2		.32					
16	.25		.20	.02	.0159		.0007	
17	.2		.32			0.009	.0009	
21	.2		.81	.03	.005	.007	.0001	
26	.12		.48			.02	.0003	0.63
Nov. 2	.10		.08			.004	.00035	.34
5		4	.27	.025	.055	.008	.00046	.6
26		1	.34					
Dec. 3	.65		.32	.003	.04	.023	.0005	.60
10		2	.136	.011	.006	.003	.00023	
25		4	.106	.0084	.004	.0048	.0025	.45
1934								
Jan. 4	.5		.081	.027	.009	.009	.002	.77
12	.2		.16	.036	.002	.009	.0007	.21
Feb. 16		2	.27	.0134	.0021		.00032	
18	.4		.32	.081	.065		.0011	.45
24		3	.64	.055	.068	.007	.0003	.79

TABLE 2.—Nitrogen and chlorine in rain and snow (pounds per acre)—Continued

Date	Precipitation in inches		Chlorine	Free amm.	Alb. amm.	Nitrate	Nitrite	Sulphate SO ₂
	Rain	Snow						
1934								
Mar. 2	0.2		0.032	0.036	0.014	0.0059	0.0006	0.54
3	.1		.08	.0011	.019	.0002	.0002	.34
6	.25		.79	.002	.041		.0005	.57
9		1	.013			.00014	.000136	
17	.4		.32	.036	.032	.0018	.0017	.91
23		2	.55	.012	.005	.0057	.0021	
30	.1		.08			.01	.0006	1.14
30	.2		.16			.22	.0006	.76
Apr. 1	.5		.4	.018	.041		.0002	
4	.2		.003	.02	.007	.0055	.0005	1.31
26	.12		.058			.006	.0005	.27
May 9	.10		.24			.0068	.0044	.23
13	.65		.15	.05	.025	.045	.0075	
21	.12		.097	.04	.03	.003	.0004	.11
24	.12		.097	.05	.017	.003	.006	
June 5	.80		1.92	.065	.058	.036	.0045	0
6	.50		.40	.036	.023	.023	.0034	0
8	1.00		.8	.02	.08	.04	.08	0
9	.15		.48	.016	.005	.007	.001	0
14	.25		.121	.024	.008	.01	.002	0
17	.08		.123			.0018	.004	0
20, 22	.65		.52	.02	.018	.015	.059	0

CIRCULATION IN THE STRATOSPHERE OVER BRAZIL

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The aerological observations in Brazil have rarely attained the height of 12 kilometers, in spite of the regularity with which they have been taken since 1921.

Only about a hundred soundings above this level have been effected over the whole country during the 12 years of operation of the Aerological Service. It is therefore impracticable to represent the results obtained by means of graphs or tables. Consequently, we shall only make a summary in the form of a simple commentary.

The level of 12 kilometers is in the stratosphere only over the southern part of the country. At the Equator, this height is within the troposphere, which there extends to about 15 kilometers above sea level. Thus the lower of the levels which we shall now discuss do not belong to the stratosphere in the equatorial zone. The layers to be studied are three: (a) from 12 to 15 kilometers; (b) from 15 to 20 kilometers; (c) above 20 kilometers. The periods are two: (a) winter (April to September, inclusive) and (b) summer (October to March, inclusive), corresponding respectively to the positions of the sun north and south of the equator. These data were furnished by the following stations: (a) in the Atlantic Ocean: Fernando Noronha; (b) along or near the coast: Quixeramobim, Olin-da, Maceio, Sao Salvador, Victoria, Campos, Rio de Janeiro, Mendes, Sao Paulo dos Agudos, Curitiba, and Porto Alegre; (c) in the interior of the continent: Cuyaba. We have arrived in this way at the following conclusions:

From 12 to 15 kilometers elevation the winds vary during summer from SE. to NW. through S. Along the coast there is a marked predominance from SE. to S. which appears to constitute the higher zone of the trade winds of the Southern Hemisphere. However, at Cuyaba, they come mainly from the W. to NW.

The winds are also the same during the winter, except at Fernando Noronha where they blow exclusively from

the W. to NW. and at Cuyaba where, notwithstanding the reported currents from SE. to S, the most frequent are also those from the W. to NW.

From 15 to 20 kilometers, the winds blow from the SE. to NE. during the summer, except at Porto Alegre where they come from the south and at Cuyaba where they blow from SE. to W.

On the coastline, in winter, the circulation is from SE. to SW., except at Fernando Noronha, where there also are winds from the NW.

Beyond the 20-kilometer level, the circulation is exclusively from the ENE. to ESE., which seems, moreover, to be generally true for the whole region. The speeds vary in the two lower layers from 7 to 15 meters per second. However, not infrequently there are in this region light winds of from 1 to 2 meters per second and, very rarely, those of even greater speeds than 15 meters per second.

Beyond 20 kilometers there are winds of greater than 20 meters per second. The maximum to date is about 42 meters per second.

It is seen then that in the layers discussed, winds from the NW. to NE. sector rarely occur. Up to 20 kilometers, the circulation is generally from the south with easterly or westerly components—winds from the NE. to E. or from the NW. to W. being noted very rarely. The latter are, however, more frequent at Fernando Noronha and at Cuyaba. The circulation is always from the east beyond 20 kilometers.

These pilot-balloon observations are the only source of real information which exists concerning the circulation in the stratosphere over the Brazilian coast, and, despite their rarity, are preferable to hypotheses based only on surface observations.